CHAGRIN RIVER WATERSHED PARTNERS

2019

Black Brook NPS-IS

Plan developed by:

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Version 1.0

Nine-Element Nonpoint Source

Implementation Strategy Plan (NPS-IS)

HUC-12: 04110002 01 05

12/16/2019

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This map was prepared by Chagrin River Watershed Partners, Inc. using federal funds under award NA18NOS4190096 from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce through the Ohio Department of Natural Resources, Office of Coastal Management. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Ohio Department of Natural Resources, or the Office of Coastal Management. Additional funding and in-kind services provided by Chagrin River Watershed Partners, Cuyahoga River Restoration, and West Creek Conservancy.

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Acknowledgements

Chagrin River Watershed Partners (CRWP) would like to thank West Creek Conservancy and Cuyahoga River Restoration for their assistance in developing this plan. Many stakeholders contributed to the

development of this plan, including Ohio EPA, Geauga SWCD, Geauga Park District, the City of Akron, the Western Reserve Land Conservancy, communities and their residents in this HUC-12.

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Chapter 1: Introduction

1.1 Report Background

This NPS-IS is the first watershed plan for this area, with no previous Watershed Action Plan developed. This plan will continue to be updated as new needs and projects are identified. As State and Federal nonpoint source funding now relies upon the development of an NPS-IS plan, this NPS-IS plan must be accepted by Ohio EPA as meeting the 9-element minimum requirement as outlined in the USEPA's Handbook for Developing Watershed Plans to Restore and Protect our Waters. CRWP and its collaborators, including watershed members and communities, local agencies and other conservation organizations recognize the importance of strategic project implementation to address impairments within this HUC-12.

1.2 Watershed Profile and History

The Cuyahoga River drains 813 square miles within the Erie-Ontario Lake Plain in parts of Geauga, Portage, Summit, and Cuyahoga Counties. The main branch of the Cuyahoga River begins at the confluence of the West Branch Cuyahoga and East Branch Cuyahoga Rivers and flows 85 miles in a U-shaped course before flowing into Lake Erie in downtown Cleveland, Ohio (ODNR 2019). The LaDue Black Brook HUC-12 (04110002 01 05) is part of the upper Cuyahoga watershed. This HUC-12 covers 12.72 square miles (Ohio EPA Integrated Report 2018). The upper Cuyahoga River's headwaters are in Chardon, Ohio; it flows south to Lake Rockwell in Franklin township and runs about 45.52 river miles. The Upper Cuyahoga River watershed covers about 207 square miles and drains 351 miles of principal streams (OEPA 2004). In the headwater area of Hambden and Montville Townships in Geauga County, the river starts out as the East Branch and West Branch and then combines just below the Village of Burton (akronohio.gov). The Upper Cuyahoga river flows about 41 miles south to Portage County and ends at the Lake Rockwell dam near Kent. Twenty-five miles of the Upper Cuyahoga River, outside the HUC-12, was designated as State Scenic in 1974. Most of the Upper Cuyahoga watershed is rural, woodland, and agricultural uses, but development pressures are growing (Environmental Design Group 2013). The Cuyahoga River was also designated an American Heritage River in 1998, and a National Heritage Corridor in 1996. The Upper Cuyahoga River is known for its preglacial valleys, which provide a source of groundwater throughout the region and sustain the flow and quality of the River during dry weather (ohiodnr.gov).

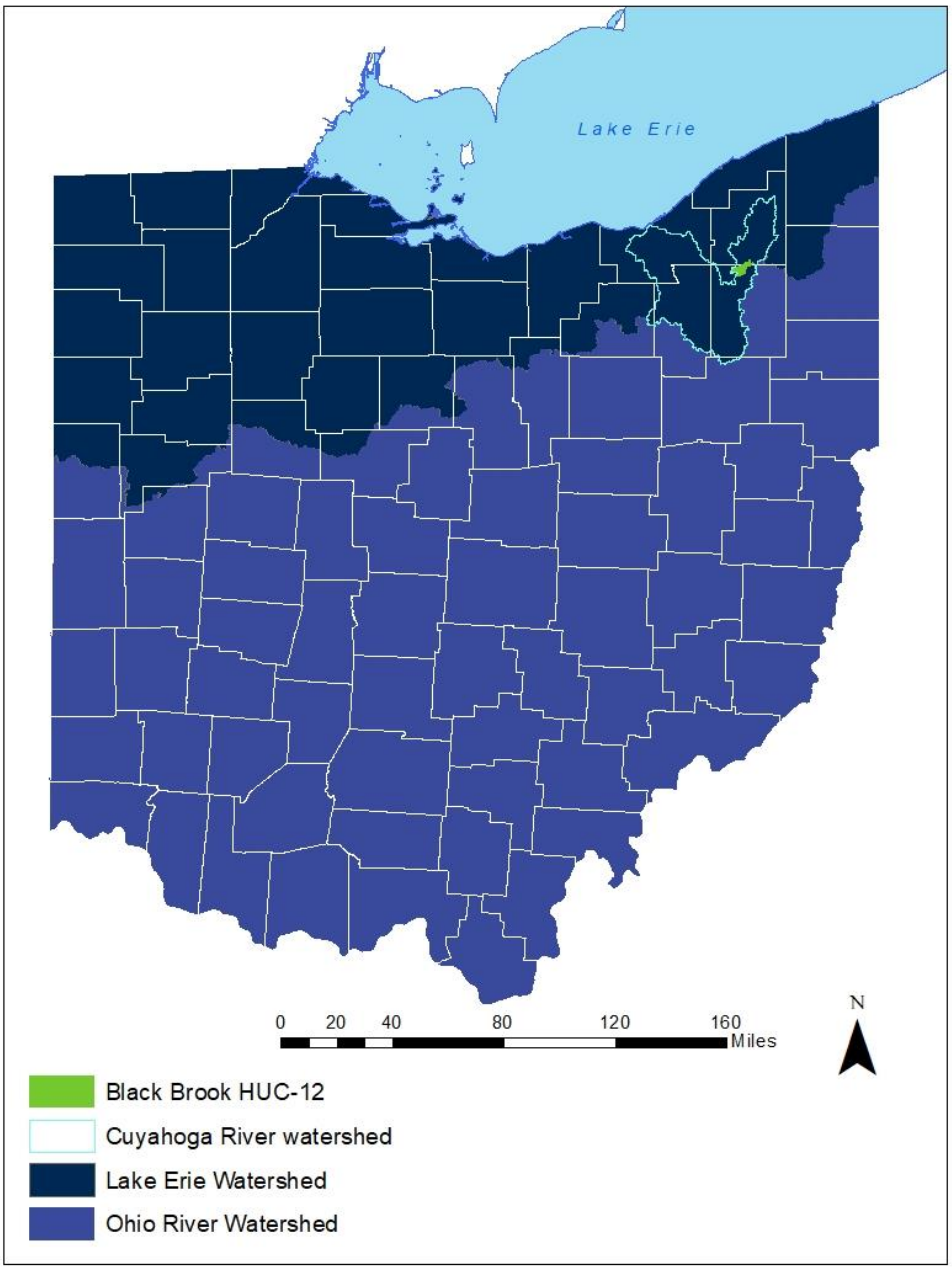

Figure 1: HUC-12 position within Lake Erie - Ohio River Basin Divide in Ohio

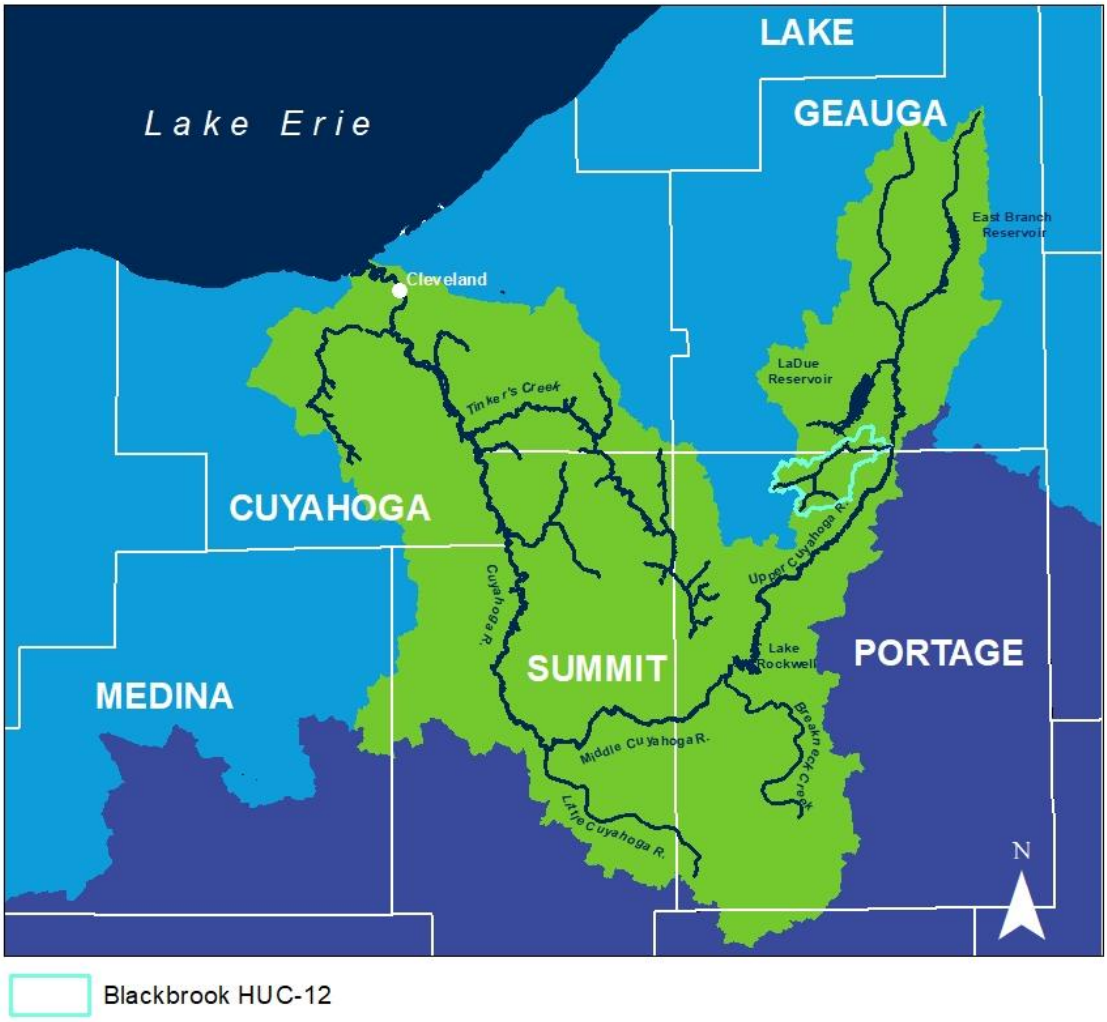

Figure 2: Position of LaDue Reservoir-Bridge Creek HUC-12 within Cuyahoga River watershed

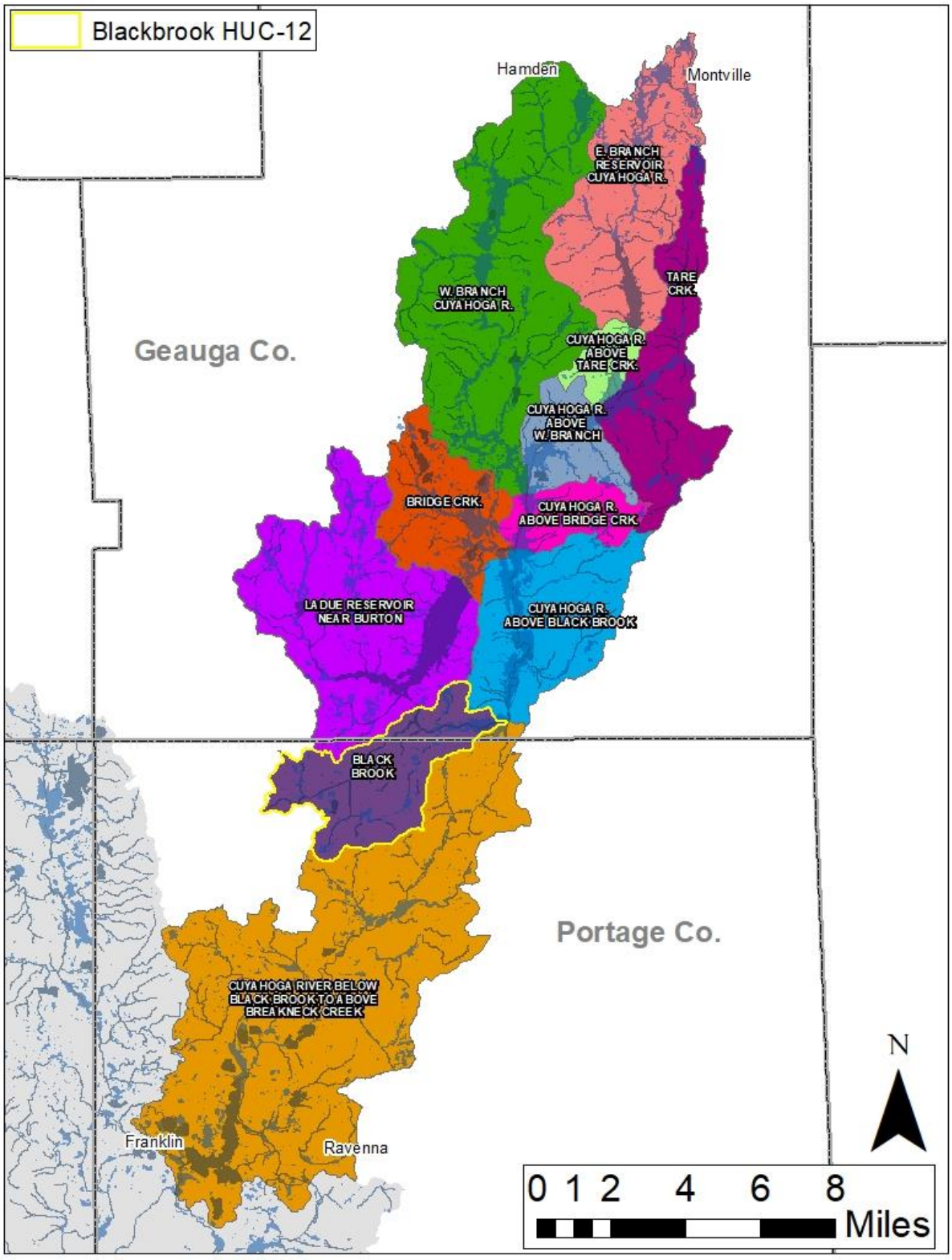

Figure 3: Upper Cuyahoga River watershed, including Black Brook HUC-12

1.3 Public Participation and Involvement

CRWP held two open houses on July 16 and July 25 to obtain public input from residents, park districts, communities, and conservation organizations for this NPS-IS. The first was held at Adam Hall in Auburn Township and the second was held at Geauga Park District's Veterans Legacy Woods. CRWP also received input via an online survey sent to stakeholders and the public. CRWP sought input at the Upper Cuyahoga Scenic River Advisory Council meeting during the formation of the plan. This council consists of citizens representing local interests and have been selected by the Ohio Department of Natural Resources. Finally, CRWP received input via meetings with Auburn Township, Mantua Township, the City of Akron, Geauga Soil and Water Conservation District (SWCD), Portage SWCD, Portage County Emergency Management, the Western Reserve Land Conservancy and other stakeholders.

Figure 4: Public input session held at Adam Hall in Auburn Township. July 16, 2019. Photo by Alicia Beattie.

Top recommended actions identified for this subwatershed included:

- Address flooding, erosion, and stormwater management challenges, particularly in the Mantua Center Road, Wayne Road, and Chamberlain and Winchell Road where flash flooding has occurred.
- Address pollution related to gravel pits and tractor trailer / dump truck travel, including preventing future petroleum releases into ditches.
- Develop and implement stormwater management, stream and wetland restoration, and floodplain reconnection and reforestation projects to address flooding, improve water quality, and provide wildlife habitat.

Chapter 2: HUC-12 Watershed Characterization and Assessment Summary

2.1 Summary of HUC-12 Watershed Characterization

The Upper Cuyahoga River Watershed's HUC-12 watersheds include East Branch Reservoir – East Branch Cuyahoga River (04110002 01 01), West Branch Cuyahoga River (04110002 01 02), Tare Creek – Cuyahoga River (04110002 01 03), Ladue Reservoir – Bridge Creek (04110002 01 04), Black Brook (04110002 01 05), and Sawyer Brook-Cuyahoga River (04110002 01 06). This plan focuses on the Black Brook HUC-12 in parts of Geauga and Portage Counties within the glaciated portion of the Allegheny Plateau in northeastern Ohio. Communities with at least part of their boundary in the HUC-12 include Mantua Township, Troy Township, and Auburn Township.

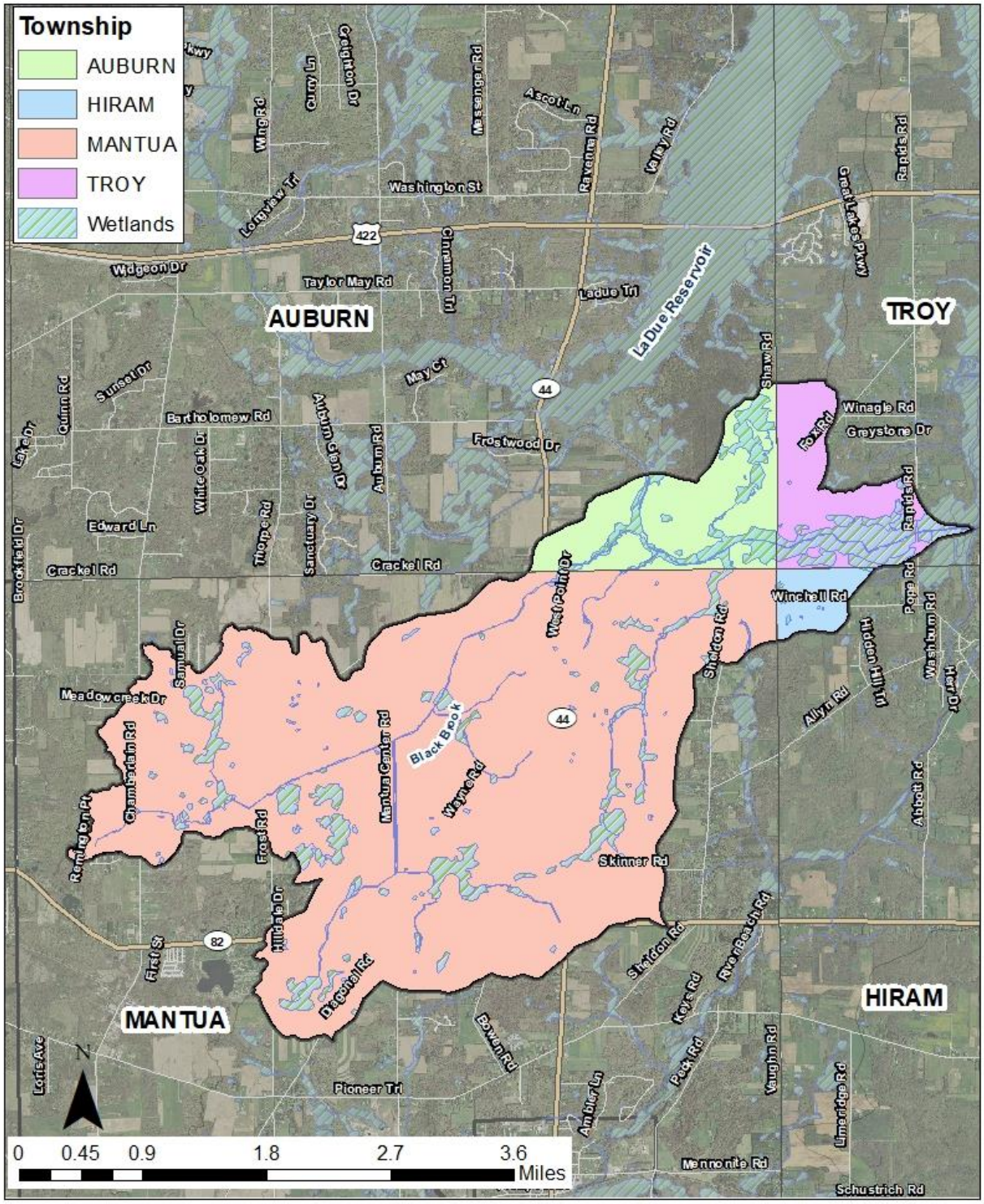

Figure 5: Townships within Black Brook HUC-12

The Black Brook Conservancy District is also present within this HUC-12. The Black Brook Conservancy District was established in 1942 primarily to control water (prevention of floods regulating streams by widening and deepening, reclaiming wet or flooded land for farming (e.g. celery, carrots, and potatoes), providing proper irrigation and conservation of water in the streams). Farmers drained much of the swampland in the early 20th century. In 1879, about a dozen property owners petitioned the Portage County commissioners to open a road through it to provide access to hundreds of acres of land. The road north from Mantua Center would become present-day Mantua Center Road. The commissioners agreed to construct a roadway, with eight-foot ditches on either side.

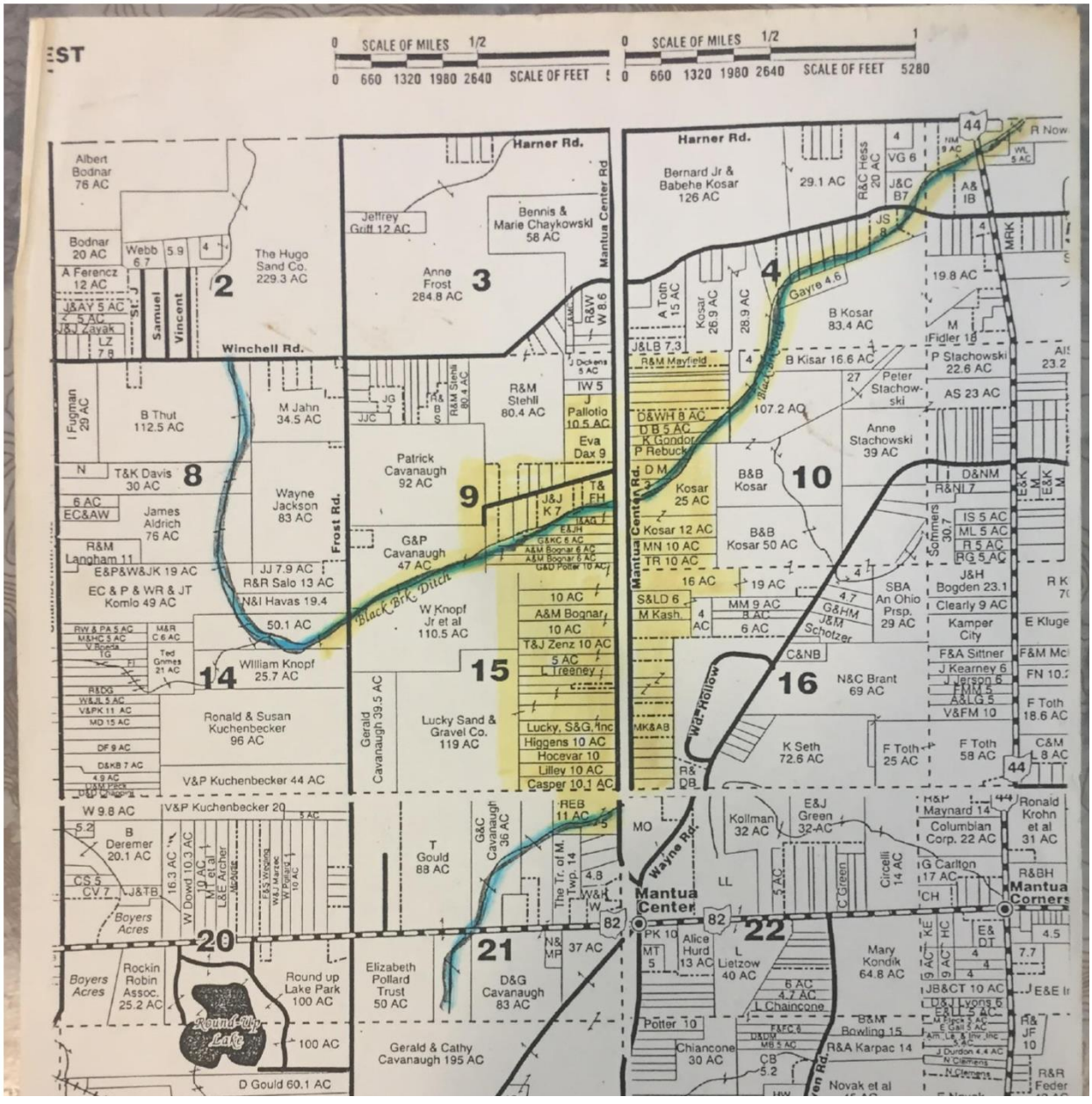

Figure 6: Blackbrook Conservancy District map (highlighted in yellow). Source: Susan Lilley, Blackbrook Conservancy District.

Mantua Muck District Gets Judge's Okay

Common Pleas Judge Blake C. Cook Wednesday approved the establishment of a conservancy district in the Black Brook district in Mantua township.

He appointed as directors Andrew Molnar, for three years; Michael Nyiri, for five years, and Bryce Strachan, seven years.

Final court approval of the conservancy district permits the directors to proceed with the operation of such a district under the state law. The approval also included setting the boundaries for the district.

A rich muck district, the Black Brook area provides much celery and other vegetables for the Cleveland market. The owners of the land petitioned the court for the establishment of the district on the basis that water is at present uncontrolled.

Included in the conservancy district's program is the prevention of floods, regulating streams by widening and deepening, reclaiming wet or flooded land, providing proper irrigation and conservation of water in the streams.

Figure 7: News article in the Evening Record about Black Brook Conservancy District. January 15, 1942.

Farms and residential areas continue to flood, and residents have expressed concern about increased flooding that may be due to increased upstream development. Most of the residents experiencing flooding problems area in Zone A, with the floods posing a health and safety risk. Although the Black Brook ditches run on both sides of Mantua Center Road, the flooding tends to be worse on the east side and driveways are often underwater.

Flooding — A common sight in Black Brook

WATERSHED FACTS

Flooding and poor drainage are an annual occurence on 1,200 acres of the watershed. Because of this, crop returns are variable and portions of the valuable muck remain idle.

Most of the crops grown in Black Brook are extremely susceptible to damage by floodwater.

Large floods occuring in May, 1956; July, 1958; February, 1959; and March, 1963 resulted in extensive damage to roads, bridges, and homes.

Enlargement of present ditches to handle floodwater is impossible because of lack of room between the road and the residences.

Road repair is expensive and officials have been reluctant to make major improvements because of frequent flooding damage.

There is a need for recreation areas in this region of Ohio. Over 3 million people live within 40 miles of Black Brook.

Figure 8: "What's Happening in Black Brook Watershed: A Soil and Water Conservation District" undated publication sponsored by Portage County Commissioners, Portage Soil and Water Conservation District, and Black Brook Conservancy District.

Figure 9: Overflowing ditches along Mantua Center Road. Photo taken July 11, 2013 by resident.

2.1.1 Physical and Natural Features

The Cuyahoga River watershed, located in Northeast Ohio, drains 812 square miles and flows through parts of six counties, with the eastern part of the watershed characterized by a mixture of agricultural land with cultivated crops and forest (epa.ohio.gov). The upper Cuyahoga watershed drains 208 square miles starting in northeastern Geauga County and flows southwest through kame and kettle topography. Most of the upper Cuyahoga is within the glaciated Allegheny Plateau (OEPA 2004). The upper Cuyahoga is considered a hotspot of rare and listed plant and animal species, with some of the highest quality wetland complexes in Ohio (Fennessy et al. 2007).

The Black Brook HUC-12 includes the west branch of Black Brook which splits into several smaller branches or sub-catchment areas. Along Mantua Center Road, Black Brook is a significantly altered stream. Part of the stream runs straight through ditches on either side of the road that are approximately 8 feet wide and 8 feet deep. The Black Brook watershed lies in the headwaters of the Upper Cuyahoga River basin in Portage County upstream from LaDue Reservoir, which has provided water to the City of Akron since 1962. Through the installation of Black Brook Dike on the main stem of Black Brook just north of the Portage County line, the drainage from the major part of this watershed has been diverted to the LaDue Reservoir on Bridge Creek in Geauga County. The LaDue Reservoir was formed from Black Brook (dike at RM 2.64) and Bridge Creek (dam at RM 2.25) (Ohio EPA 2003). Black

Brook Dike (earthen) is 1,500 ft. long and 20 ft. high (elev. 1138.50) (Environmental Design Group 2013). The gradient of the main stem varies from 20 feet per mile just below the headwaters area and is reduced to 3-4 feet per mile through the flat lands near the north boundary of Portage County. The tributaries generally have low gradients and are meandering except where straightened by dredging, such as along Mantua Center Road (Portage SWCD 1963).

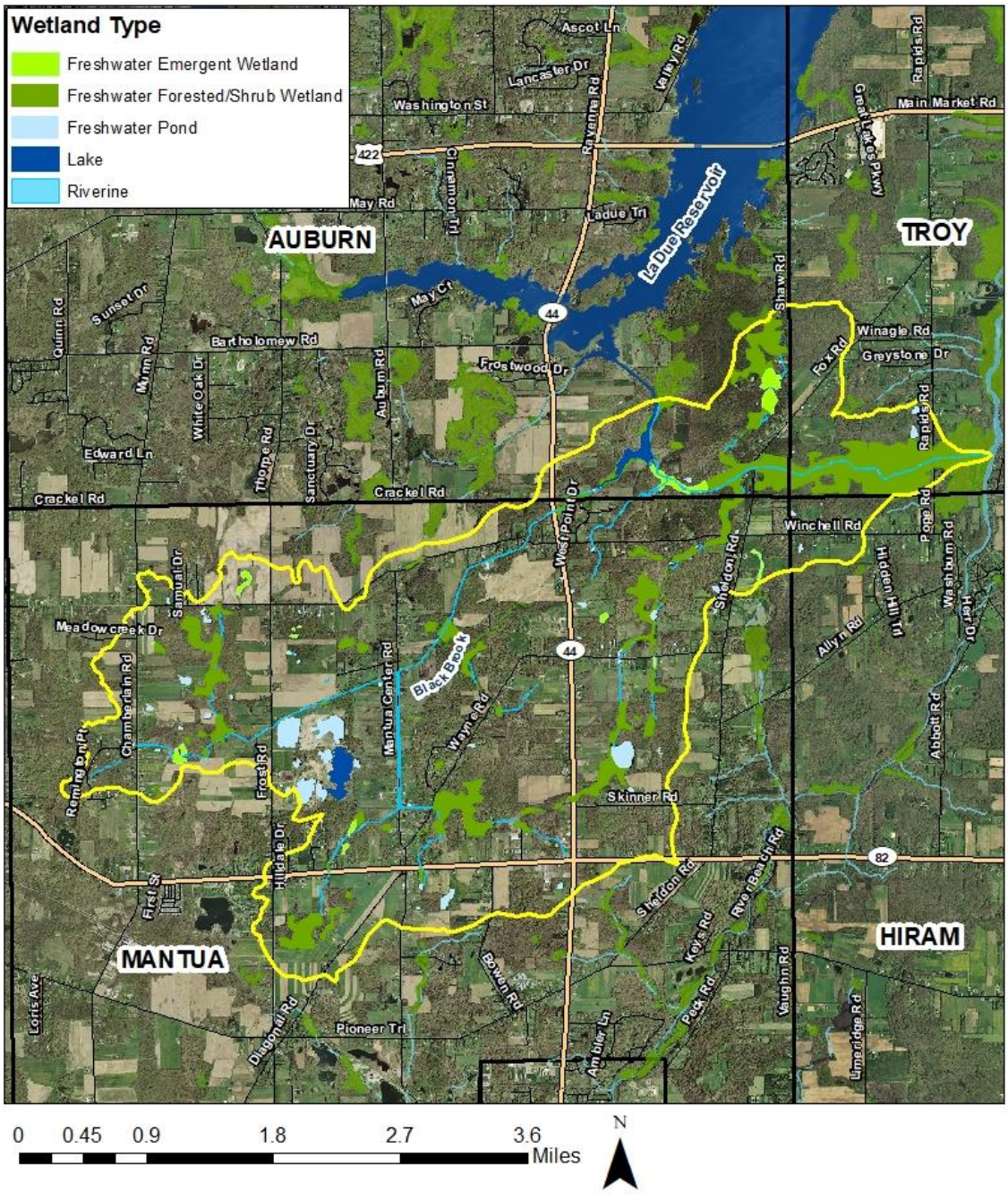

Figure 10: Wetland types in HUC-12 (Source: NWI)

Table 1: Wetland types in HUC-12 (Source: NWI)

Type	Acres	Percentage of total
Freshwater Emergent Wetland	49.23	5.35
Freshwater Forested/Scrub Wetland	661.35	71.90
Freshwater pond	119.30	12.97
Lake	43.08	4.68
Riverine	46.90	5.10
	919.85	100

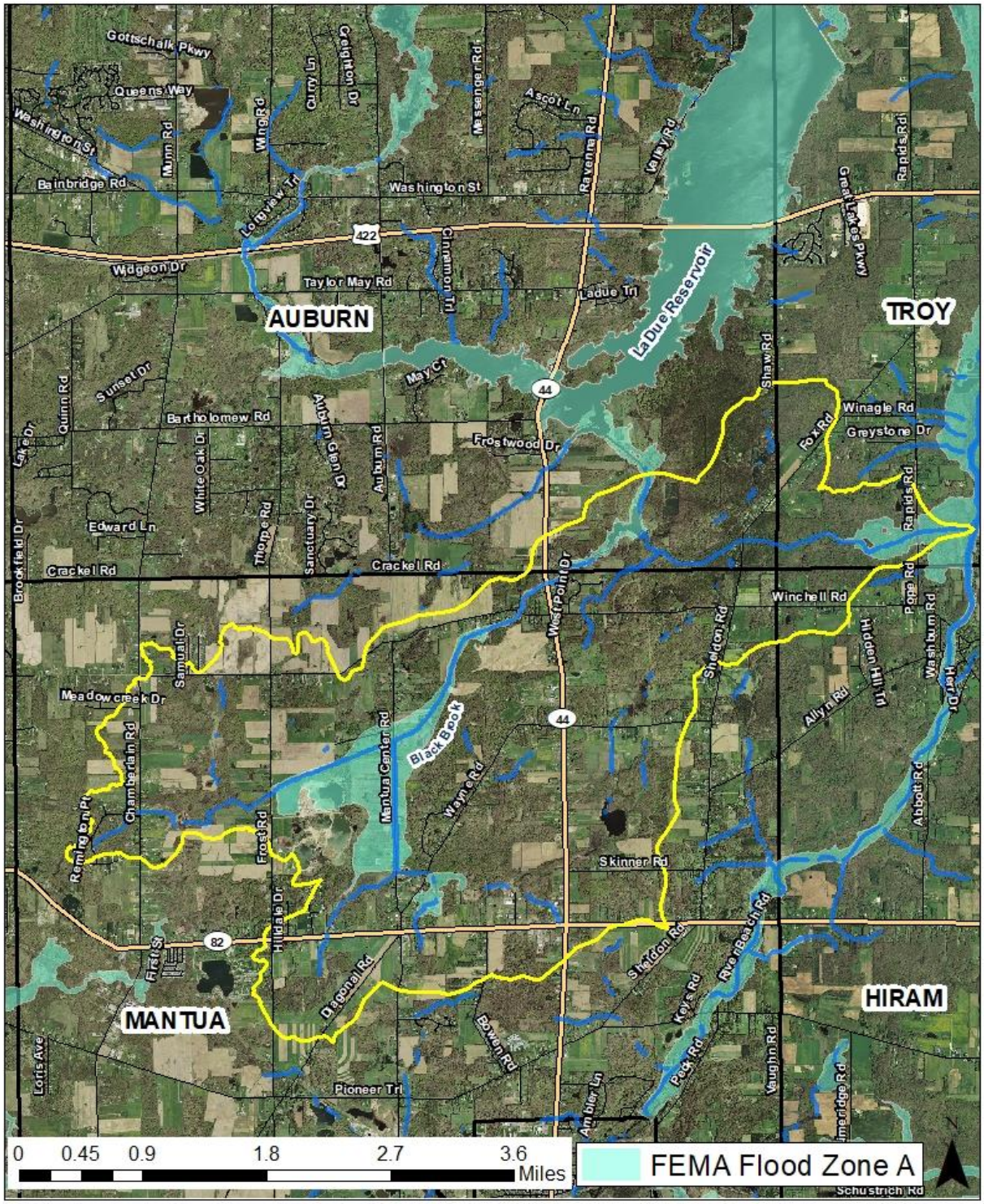

Figure 11: FEMA Flood Zones

A large area along Mantua Center Road is classified by FEMA as Flood Zone A, meaning the property has a 1 percent chance of flooding. Residents have pointed to newer development as well as a sand and gravel pit as reasons flooding has worsened. Portage County Office of Homeland Security and

Emergency Management recommended pursuing funding to conduct a flood study to evaluate alternatives to understand and deal with flooding in this area.

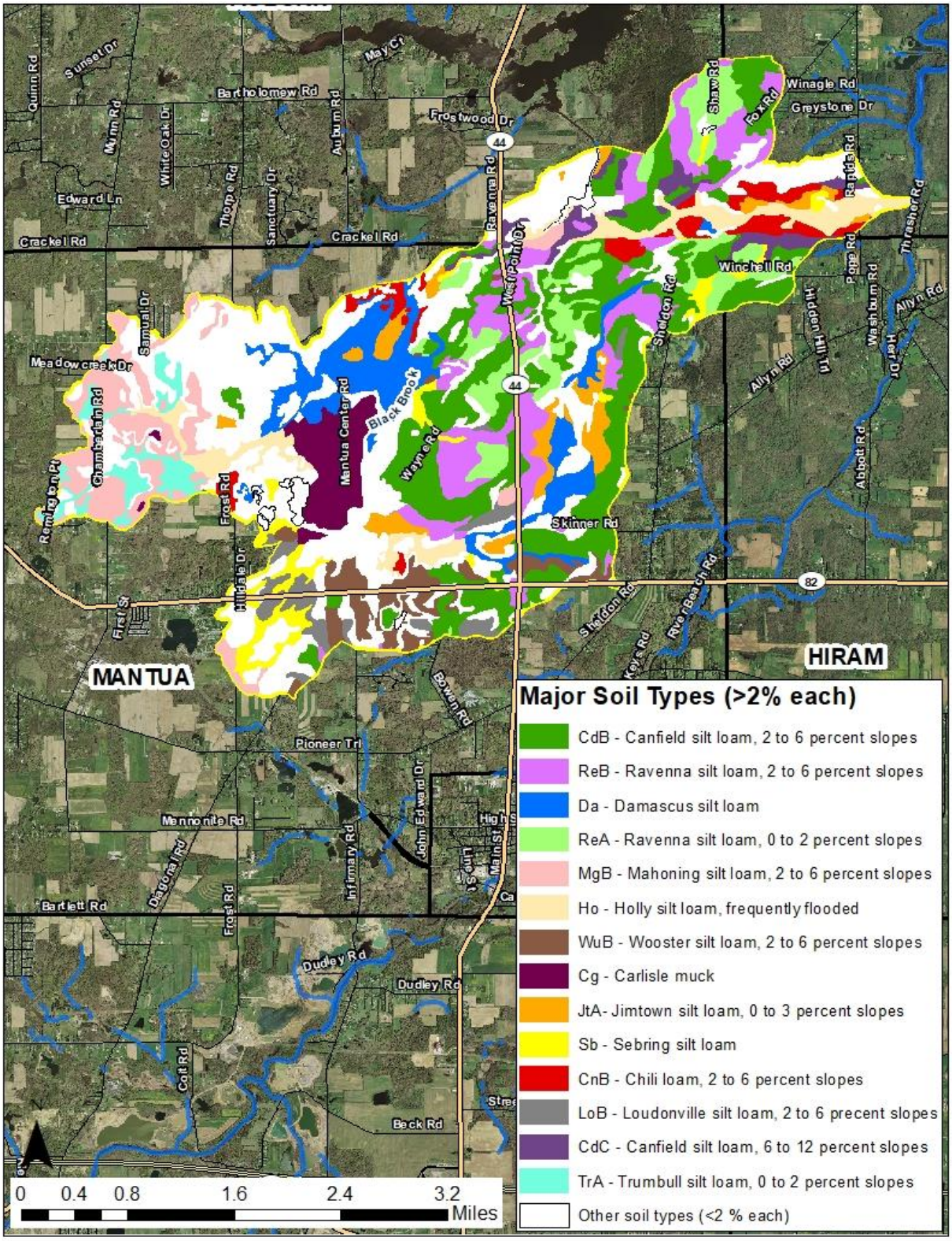

Figure 12: Major soil types in HUC-12 (Source: USDA)

2.1.2 Land-Use and Protection

The predominant land uses in this area include rural residential developments, farmland, and forest. Land in this HUC-12 is classified by Ohio EPA as forested (45.0%), row crops (25.1%), grass/pasture (16.9%), , and developed (10.9%).

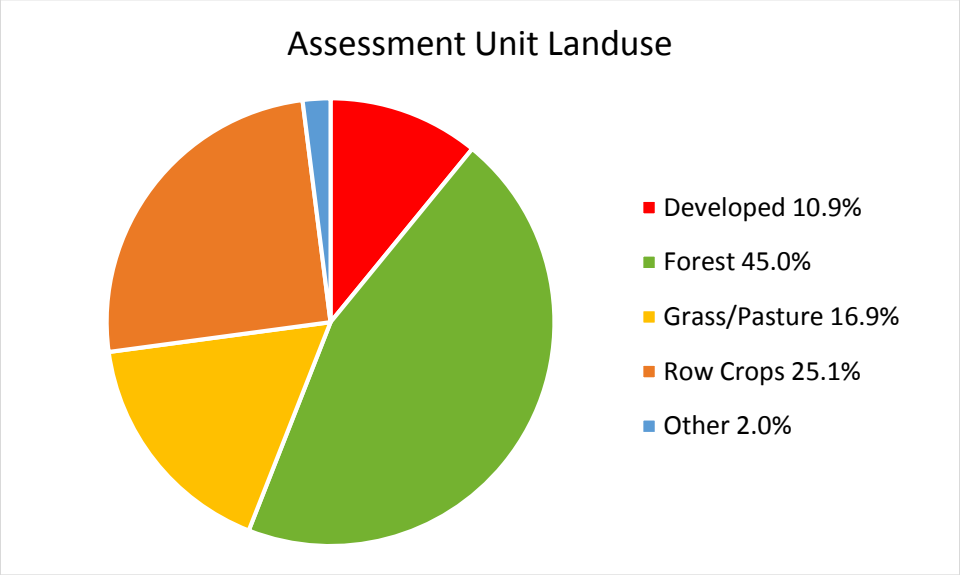

Figure 13: Land use in LaDue Reservoir-Bridge Creek HUC-12 (Source: Ohio EPA Integrated Report 2018).

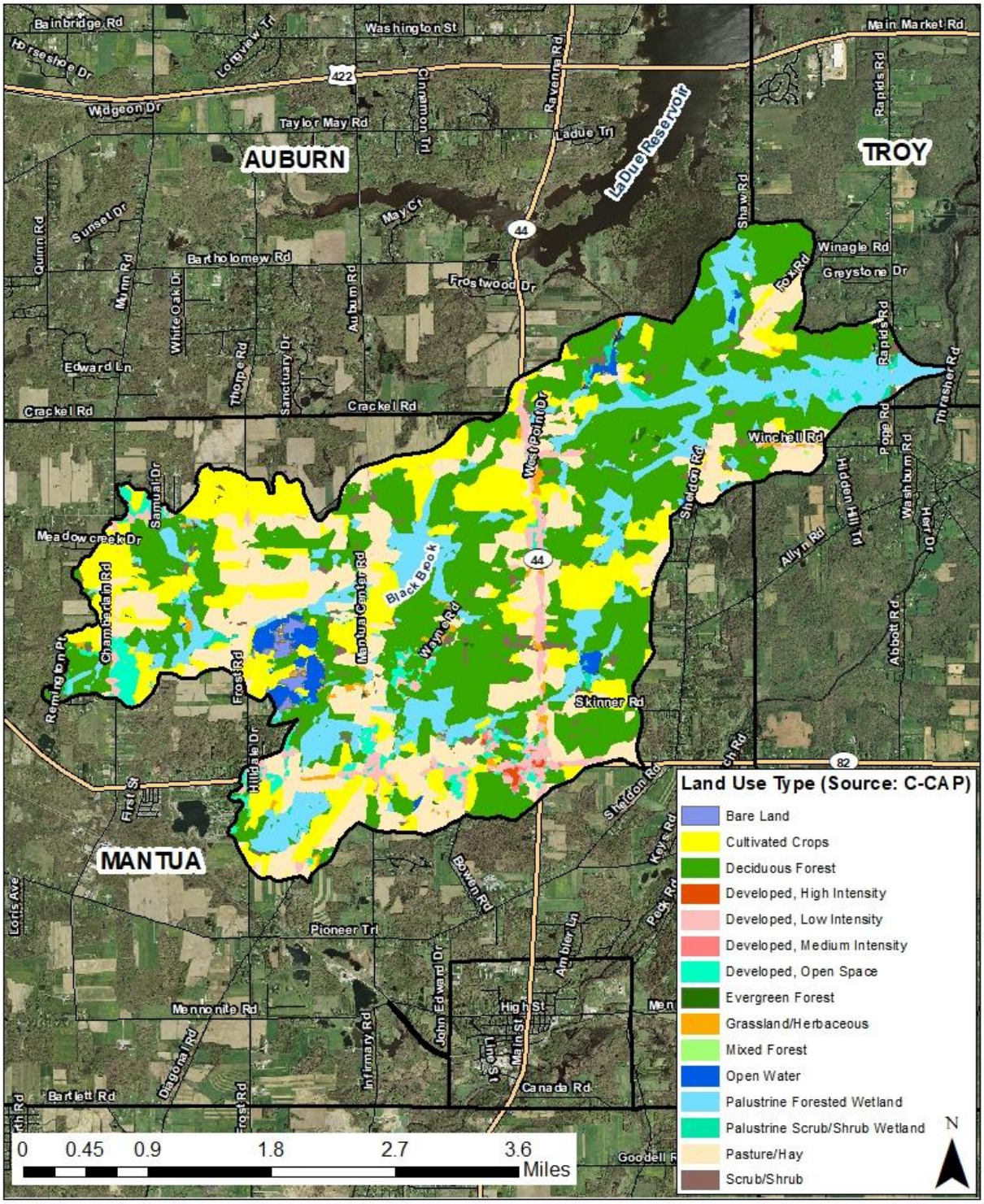

Figure 14: Land use types (Source: Coastal Change Analysis Program)

Data from the National Oceanic and Atmospheric Administration (NOAA)'s Coastal Change Analysis Program (C-CAP) indicates that most of the land area in this HUC-12 indicates predominant land use

types as cultivated crops, pasture/hay, deciduous forest, and palustrine forested wetland. Development intensity is highest along State Route 44 and State Route 82 (Twinsburg Warren Road).

Public or protected areas in this HUC-12 include the following:

- The City of Akron owns property in the northern part of this HUC-12, including the Black Brook Dike (technically a dam) as well as forested Black Brook corridor property flowing to the east to its confluence with the Cuyahoga River east of Rapids Road. The land consists of high quality, diverse, mature forest of second and third growth. The land surrounding Black Brook is part of Akron's partnership with ODNR for public hunting/fishing and all of the land (except a 500-foot radius buffer around critical infrastructure such as dams) is publicly accessible.

Figure 15: City of Akron property north of Black Brook dike. August 17, 2017. Photo by Alicia Beattie.

- The Black Brook Conservancy District owns three properties (no structures) west of Mantua Center Road: 23-015-00-00-024-000 (8 acres), 23-015-00-00-022-000 (10 acres), and 23-015-00-00-021-000 (10 acres). These properties could be used to help with flood control.

Figure 16: Black Brook Conservancy District land. August 17, 2017. Photo by Alicia Beattie.

- Mantua Township / Board of Trustees owns about 30.6 acres near the intersection of State Route 82 and Mantua Center Road. This includes the Mantua Township Town Hall built in 1840, which is part of the Mantua Center Historic District.

Figure 17: Mantua Township Hall. June 7, 2017. Photo by Alicia Beattie.

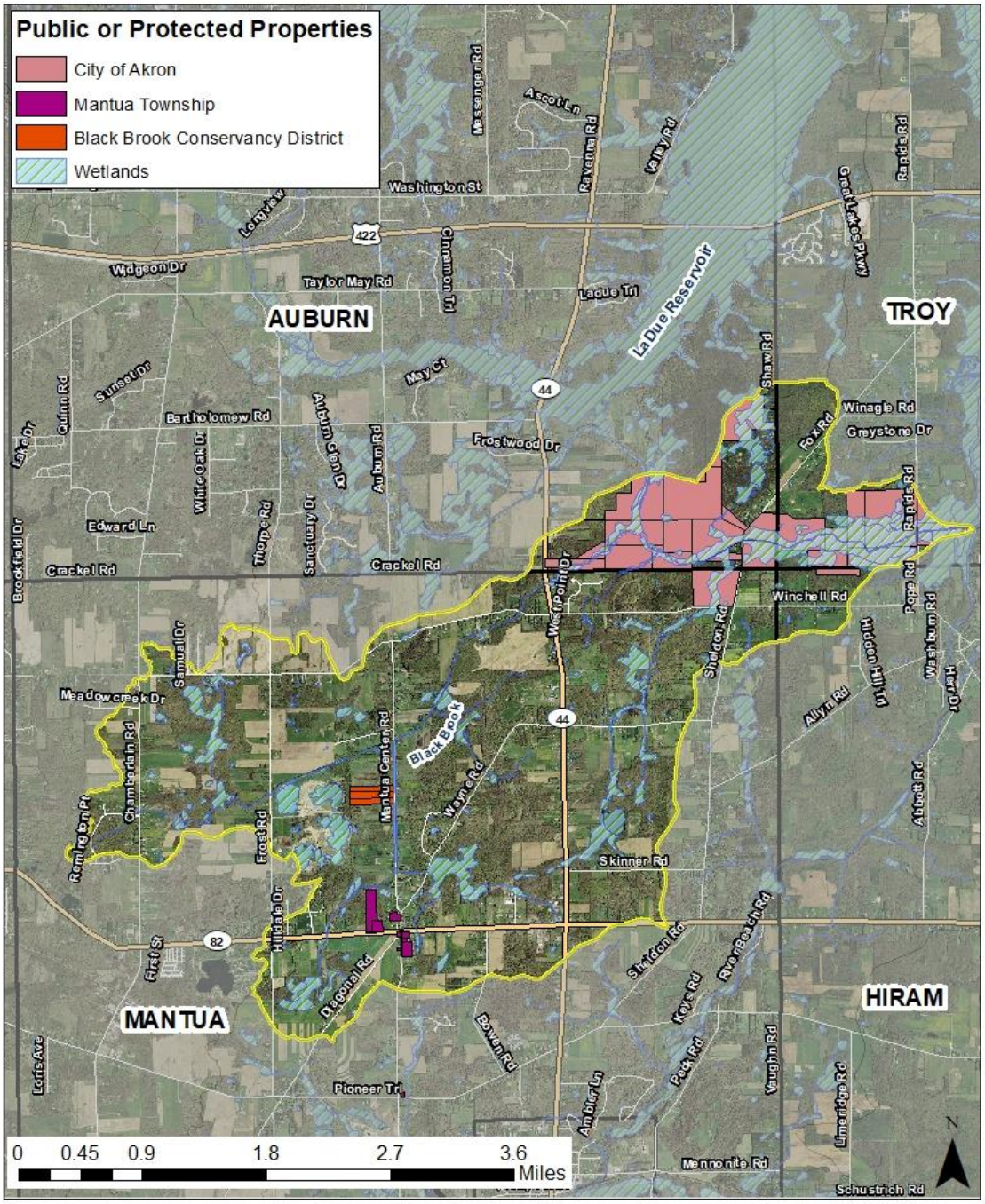

Figure 18: Public or protected properties

2.2 Summary of Biological Trends

The 2004 EPA TMDL report on the Upper Cuyahoga categorizes Black Brook as being in full biological attainment both above and below Black Brook Dam on LaDue Reservoir. Black Brook @ Fox Road is in full attainment based on fish and macroinvertebrate surveys in 2018.

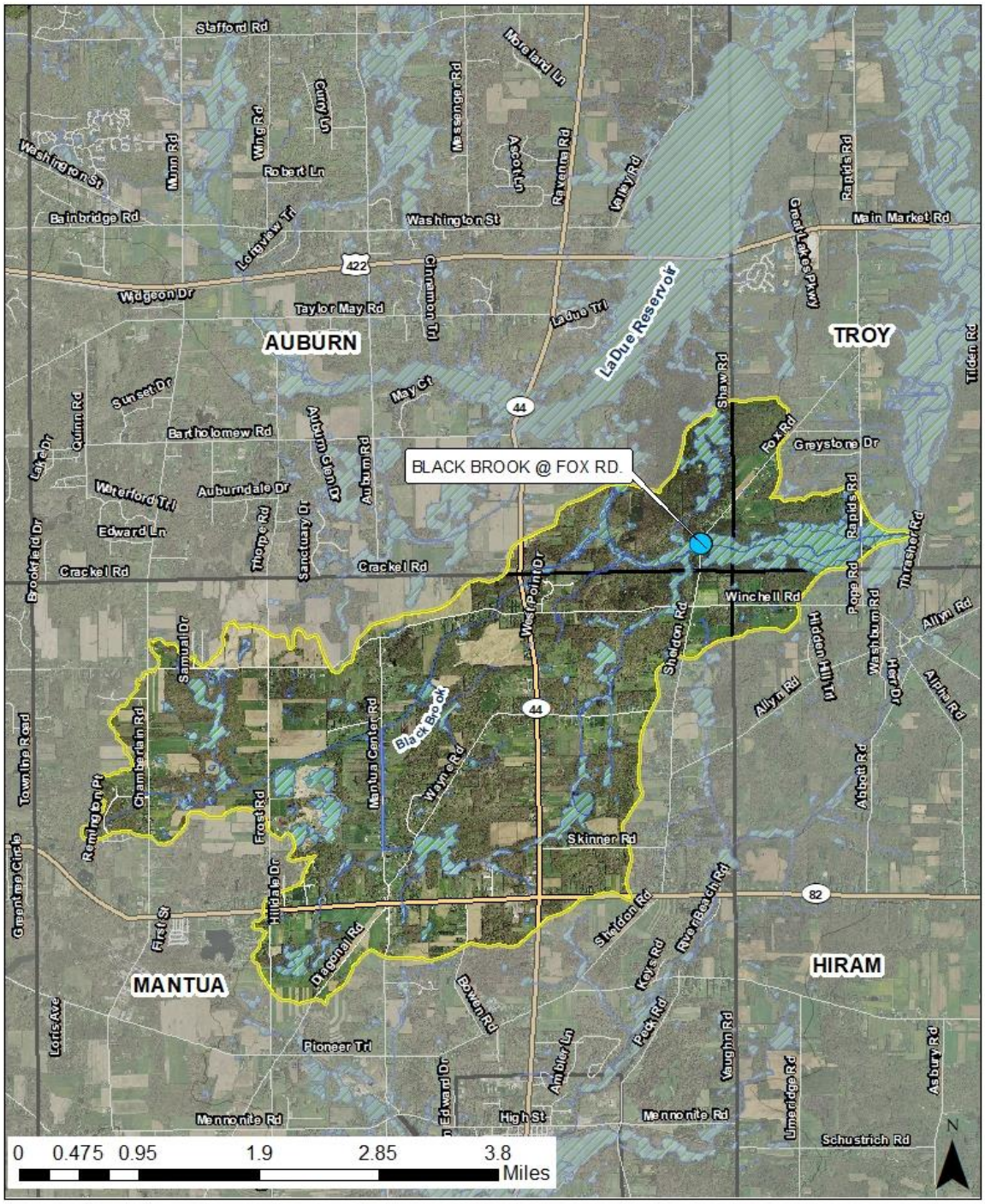

Figure 19: Biological Monitoring Site. Source: Ohio EPA (2019).

The Ohio EPA adopted biological criteria into the Ohio Water Quality Standards in 1990. An aquatic life use (ALU) designation is assigned to a stream or river based on the potential aquatic biological community that can realistically be sustained given the biological, physical, and chemical attributes of the waterway. Specifically, two fish and one macroinvertebrate indices are used to determine if a specific stream segment is reaching aquatic life use designation (IBI, ICI, QHEI). **Error! Reference source**

not found. lists the biological criteria for applicable aquatic life use (ALU) designations in the Erie-Ontario Lake Plains ecoregion.

Biological Index	Assessment Method	Biological Criteria for the Applicable Aquatic Life Use Designations		
		WWH	EWH	MWH
IBI	Headwater	40	50	24
	Wading	38	50	24
	Boat	40	48	24 / 30
MIwb	Wading	7.9	9.4	6.2
	Boat	8.7	9.6	5.8 / 6.6
ICI*	All	34	46	22

*34-40 = good. 30-32 = marginally good. 22-28 = fair.

Station Name	RM	ALU	Invertebrate Collection date	Quality Invertebrate Taxa Count	Invertebrate Score	Fish Sampling Date	Bio criteria Type	IBI Score	MIWB Score	QHEI
BLACK BROOK @ FOX RD.	1.78	WWH	07/12/2018	77	Exceptional	08/08/2018	Headwaters	40	-	67.75

Figure 20: Biological Monitoring Sites. Source: Ohio EPA

2.3 Summary of NPS Pollution Causes and Associated Sources

According to Ohio EPA's Total Maximum Daily Report for the Upper Cuyahoga Final Report (2004), major causes of impairment include organic enrichment / dissolved oxygen issues, flow alteration from historic channel modification, habitat alteration, and nutrients. There are also influences from extensive natural wetlands. Many of the residents have home septic systems which are failing and for which flooding, poses a water quality concern. Evidence of fecal contamination (raw sewage) in the ditches is evident and this is of concern to drinking water quality. Too much water in leach fields can cause septic systems to overload and slow down or stop the treatment of wastewater. There have also been concerns about mulching operations in the area leaching chemicals into the ditches during flood events.

Many of the homes are built on areas that were once farmed. However, residents are suffering from repetitive flooding problems. Residents have expressed concerns about increased flooding due to upstream development, which is in line with the Portage Hazard Mitigation Plan's note that, "The development in Portage County has also drastically increased, thus, increasing the threat of flash flooding due to the increase in impervious surfaces."

The HUC-12 includes the Source Water Protection Area identified in the Drinking Water Source Assessment for the City of Akron (Ohio EPA 2003). This document states that source water protection efforts should focus on controlling agricultural and urban runoff, with attention to sources of nitrates, phosphorus and fecal bacteria as a protective strategy. The strategy notes that, "Water quality monitoring of the Cuyahoga River and its tributaries found bacterial contaminants, chlorides and nutrient enrichment present at several sites within the protection area. Concentrations of fecal coliform bacteria exceeded water quality standards for primary contact recreation at several sampling locations" (pg. 8). Within Ohio EPA's Integrated Report (2018), the Black Brook HUC-12 is an impaired watershed in terms of human health.

Table 2: Black Brook HUC-12 Prioritized Impaired Waters of Ohio (Ohio EPA 2018 Integrated Water Quality Monitoring and Assessment Report

Section L.4. Section 303 (d) List of Impaired Waters		Sq. Mi. in Ohio	Human Health	Recreation	Aquatic Life	PDW Supply	Priority Points
Assessment Unit	Assessment Unit Name						
04110002 01 05	Black Brook	12.72	5	3	1ht	0	2*

2.4 Additional Information for Determining Critical Areas and Developing Implementation Strategies

CRWP competed GIS analyses using publicly available shapefiles. In addition, CRWP reviewed relevant land use plans. The Auburn Township land use plan (Geauga County Planning Commission 2016) provides recommendations for maintaining or improving water quality including:

- Working on stormwater management and sediment control
- Protecting critical natural areas (wetlands, floodplains, unique natural areas) through voluntary methods such as restrictive covenants
- Educating the public with respect to “best management practices” to protect riparian corridors, wetlands, and floodplains,
- Providing educational support with regards to protection of surface and groundwater resources from pollution through the maintenance of on-site sewage systems
- Continuing to identify and develop township recreational (active and passive) needs and resources
- Protect sensitive open space by working with landowners to preserve them through methods such as voluntary deed restrictions
- Conserve the supply of groundwater and open spaces
- Promote public stewardship of forests and wetlands
- Conserve fish and wildlife

Chapter 3: Critical Area Conditions and Restoration Strategies

3.1 Overview of Critical Areas

This subwatershed includes a large amount of undeveloped, ecologically sensitive areas with forests, wetlands, and streams acting as natural filters for removing pollution and moderating the effects of stormwater runoff. Preservation and management of City of Akron lands as well as other high-quality landscapes with aquatic resources is key for preventing water quality degradation and loss of wildlife habitat. The most cost-effective method is to maintain these high-quality systems, with special attention to keeping or restoring forested buffers along streams and wetlands. Ecologically minded forest management and restoration of forest landscapes around water resources will be critical for maintaining and improving water quality. Croplands managed to keep soil healthy and minimize potential for excess soil and chemical runoff are also key to maintaining watershed health. This NPS-IS plan has identified critical areas to maintain or improve attainment of aquatic life use, focusing on protection of water resources, targeted land management, and aquatic resource restoration.

3.2 Critical Area 1: Riparian Corridors and Wetland Buffers

Protecting and restoring riparian corridor and wetland habitats in this subwatershed will be critical for maintaining or improving water quality as well as preventing the loss of biological diversity. Areas along streams and wetlands with native vegetation protect the stream from erosion and absorb nutrients from overland and subsurface flows. The Upper Cuyahoga is well known as a hotspot of rare and listed plant and animal species, with some of the best wetland complexes in the State of Ohio. Given this sensitivity, it is a high priority to protect lands with high quality aquatic resources and restore degraded areas by planting native vegetation, restoring eroding banks, and addressing hydrological alterations. Groundwater is also a primary source of drinking water for residents living in the townships within this HUC-12; therefore, the management of groundwater resources is a paramount concern in order to maintain quality and quantity. This critical area includes areas with nonpoint source related impairments as well as areas with relatively healthy waters in need of protection from degradation by nutrients and sediment, particularly with regards to ongoing development threats.

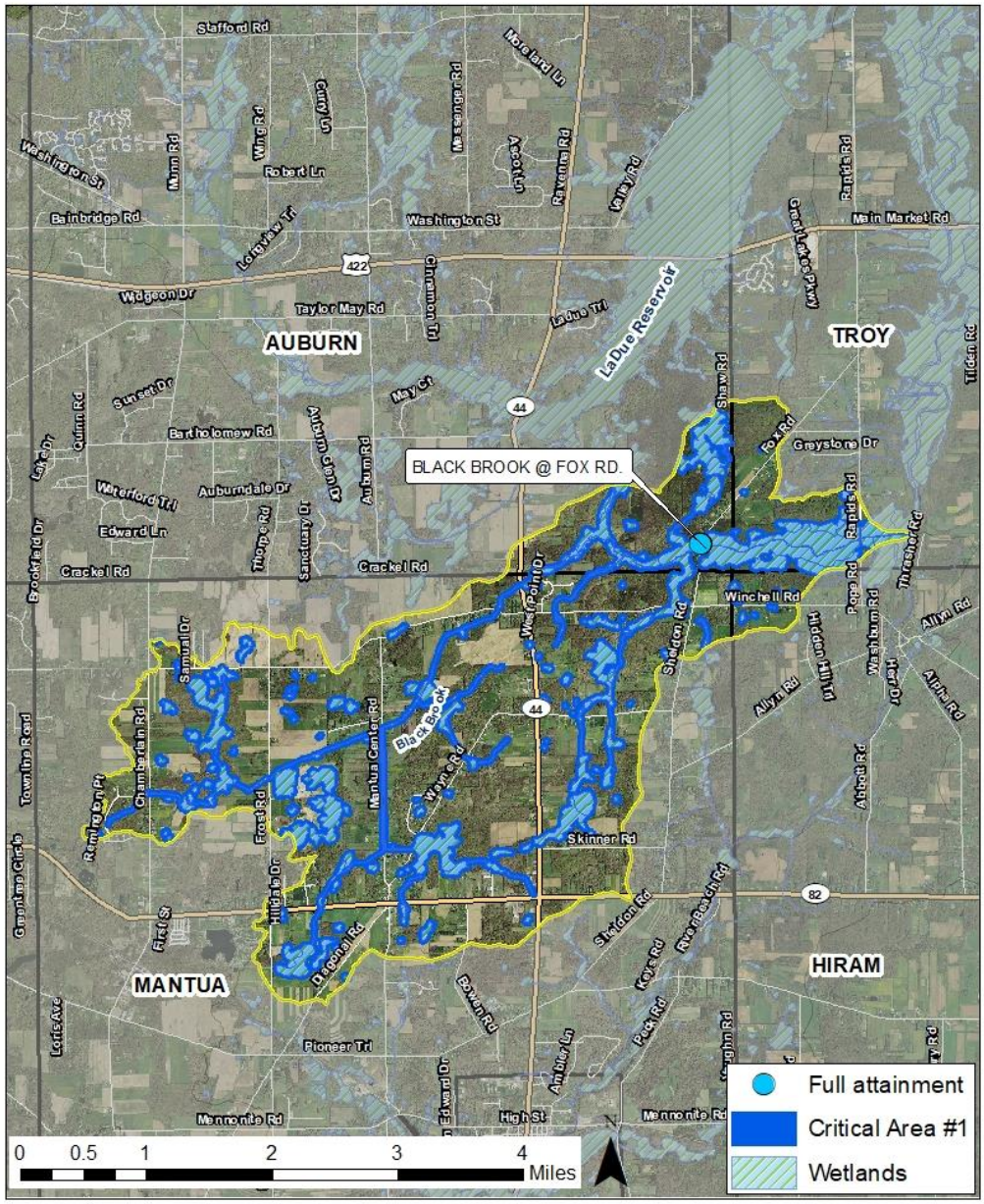

Figure 21: Critical Area 1: Riparian and Wetland Buffers

3.2.1 Detailed Characterization

This area includes the riparian areas of Black Brook as well as numerous wetland complexes throughout the HUC-12. These wetlands serve critical functions in terms of filtering water and minimizing flooding during heavy rains and major weather events. In the late 19th century, a road today named Mantua Center Road was built with 8-foot deep ditches on either side and the surrounding swamps were drained. This area was farmed for celery, carrots, and green onions. However, flooding continued to create problems for the farmers. Today, many residents living along Mantua Center Road continue to experience flooding during large rain events.

Figure 22: Flooding on residential property along Mantua Center Road. January 12, 2017.

Figure 23: Channelized reach of Black Brook downstream south of Winchell Road. Photo taken August 17, 2017 by Alicia Beattie.

3.2.2 Detailed Biological Conditions

Black Brook at Fox Road is in full attainment based on an exceptional invertebrate score and IBI of 40. Sensitive invertebrate taxa at this site identified from July 2018 sampling included the following: *Microtendipes rydalensis*, *Ligumia nasuta*, *Neocloeon* sp, *Maccaffertium vicarium*, *Stylogomphus albistylus*, *Chimarra obscura*, *Neophylax* sp, *Pycnopsyche* sp, *Molanna* sp, *Oecetis persimilis*, *Mystacides* sp., and *Rheotanytarsus pellucidus*. This site also had a large number of Rainbow Darter, a species considered highly sensitive to pollution (Ohio EPA 2019). Based on data collected 2000 indicating full attainment for Black Brook, biological communities maintained good quality but appeared enriched downstream from the Black Brook Dike/LaDue Reservoir outlet (RM 2.64). Ohio EPA's TMDL report notes that, "Extremely high densities of filter-feeding midges suggest high suspended solid levels, possibly planktonic algae from the shallow epilimnetic reservoir release. Based on similarities in macroinvertebrate community composition, enrichment influences extended downstream from Black Brook and into the Cuyahoga mainstem" (Ohio EPA 2004).

Below Black Brook Dam, the banks of Black Brook are heavily covered in invasive honeysuckle which City of Akron staff are actively treating. Scattered through these streambanks are flat wetland areas which would probably benefit from invasive species control.

3.2.3 Detailed Causes and Associated Sources

Low dissolved oxygen has historically been the primary water quality concern in the Upper Cuyahoga River watershed, with the upper reaches between East Branch Reservoir and Black Brook receiving hypolimnetic and epilimnetic releases from Akron water supply reservoirs. This area is characterized as having sluggish flow, historic channel modification, and influences from extensive wetlands. While habitat is dominated by modified characteristics due to previous channelization, flow augmentation from LaDue combined with woody debris from restablished riparian buffers has helped with pool formation and channel development (Ohio EPA 1999). Likely impacts to water quality include agricultural runoff from fertilizers and pesticides as well as broken/failing sewer and septic systems near Black Brook. These systems are often not in compliance and often require a visit from the local health department. The water flow of the Black Brook area has been highly manipulated by humans for many decades. Farming activities as well as residential developments and associated drainage ditches have changed the natural flow of the water. Many of the ditches are not functioning as intended and water drainage is a problem. This area was historically made of large natural wetlands. Restoring part of the land to its original condition would help alleviate some of the massive flooding problems experienced by landowners. Discharge and runoff from failing septic systems likely negative impacts water quality in this HUC-12 (Environmental Design Group 2013).

Some of the field land surrounding Black Brook Dam (41.351244, -81.211832) has been allowed to regrow in recent years and is currently in scrub/shrub habitat and dominated by dogwood shrubs and invasive Autumn Olive. These areas would benefit from targeted reforestation. Additionally, the woods surrounding Black Brook (41.349161, -81.200637) have been heavily influenced by the Emerald Ash Borer. Beech Leaf Disease has also been identified. The Black Brook Dam, surrounding block of forested Akron lands, streams, and Black Brook itself are areas which have been recently targeted by Akron staff for invasive species (e.g. Glossy Buckthorn, Bush Honeysuckle, Oriental Bittersweet, Autumn Olive, Phragmites, Reed Canary Grass, and Multiflora Rose control as part of sustainable forestry. Additional invasive species management work is needed in the riparian areas of Black Brook as well as replanting with native shrubs and trees. Several of the larger field areas around the dam are in a state of natural succession but could benefit from native plantings or large-scale reforestation, as less-desirable tree species such as Black Locust and Red Maple tend to establish themselves first in these areas.

3.2.4 Goals and Objectives for Critical Area

The overall nonpoint source restoration goals of the NPS-IS plan are to improve IBI, MIwb, ICI, and QHEI scores so that partial or non-attainment status can achieve full attainment of the designated aquatic life use and that full attaining reaches may maintain their status. Bringing impaired sites into attainment and protecting attaining sites is a priority. Specific goals referencing assessment points are outlined here:

Goal 1: Protect Black Brook @ Fox Rd. by achieving an IBI score of 40 or higher.

ACHIEVED: Site currently has IBI of 40.

Goal 2: Protect Bridge Creek Dst. Ladue Reservoir @ Stafford Rd. by achieving an ICI score of 34 or higher (good).

ACHIEVED: Site currently has an ICI of Exceptional (≥46).

Objective 1: Restore eroding streambanks by removing invasive species, increase native plant cover (including reforestation) in riparian / wetland buffer areas, and restore streams and wetlands using bioengineered design features.

- Restore 12,000 or more linear feet of streambank within Critical Area 1.
- Native plant revegetation of at least 200 acres of riparian / wetland buffer areas.
- Restore at least 75 acres of wetlands.
- Treat 500 acres of invasive plants in stream corridor and wetland areas.

Objective 2: Preserve and protect 2,000 acres or more of habitat with critical riparian corridors / wetland habitat.

- Protect habitat with ecologically valuable aquatic resources through acquisition and/or conservation easements.
- Riparian setback adoption for Troy Township and Hiram Township.
- Riparian setback enforcement for Auburn Township and Mantua Township.

Objectives may be modified, and additional objectives added as necessary until the streams are in full attainment of their aquatic life uses.

As these objectives are implemented, water quality monitoring (project related) will be conducted to determine progress toward meeting the identified goals (i.e. water quality standards and established metrics). These objectives will be reevaluated and modified if determined to be necessary. When reevaluating, CRWP will reference the Ohio EPA Nonpoint Source Management Plan Update (Ohio EPA, 2013), which has a complete listing of all eligible NPS management strategies to consider including:

- Urban Sediment and Nutrient Reduction Strategies
- Altered Stream and Habitat Restoration Strategies
- Nonpoint Source Reduction Strategies; and
- High Quality Waters Protection Strategies.

3.3 Critical Area 2: Agricultural and Timber Harvest Areas

3.3.1 Detailed Characterization

This critical area includes current or former cropland (row crop), animal farms / pasture (including residential horse farms) or areas used for timber harvest. Development of ecologically sound management plans and implementation of best management practices to reduce sediment and nutrient runoff are important to long-term health of aquatic resources. Based on the land use characterization in the Ohio EPA Integrated Report (2018), there are about 3,420 acres of row crops and grass/pasture in this HUC-12.

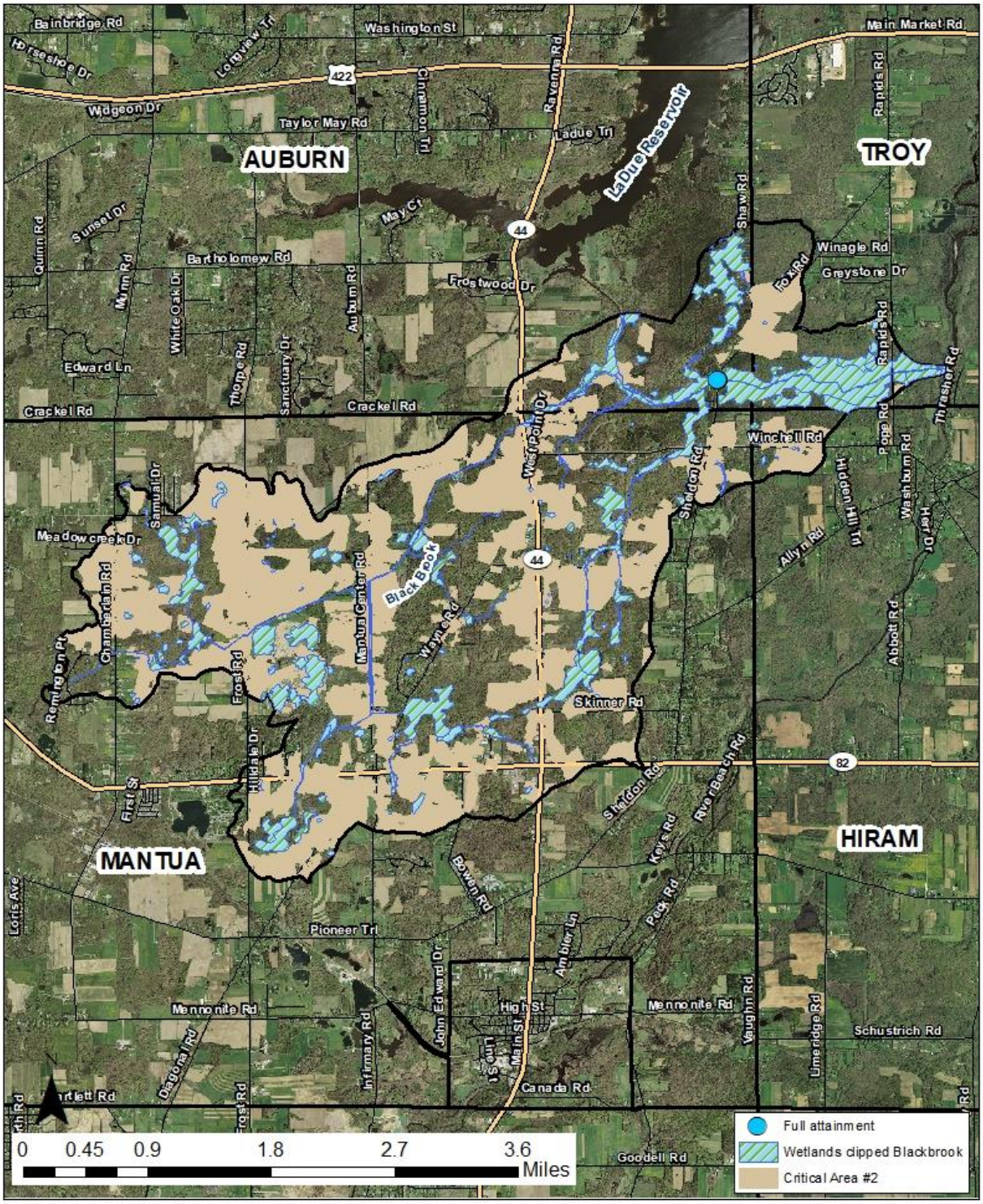

Figure 24: Critical Area 2

3.3.2 Detailed Biological Conditions

Please refer to 3.2.2 Detailed Biological Conditions.

3.3.3 Detailed Causes and Associated Sources

Fertilizing, pesticide use, and soil erosion on agricultural lands are a few of the impacts that can impair water quality (Environmental Design Group 2013). Agricultural ditches, which help with the removal of surface and ground water for crop production, are also areas where nonpoint source pollution (including nitrogen, phosphorous, and sediment) is often concentrated. These areas often have a loss in services such as water purification, downstream flood control, and the provision of wildlife habitat. In cases where former croplands are protected, forest edges can be very important in acting as a barrier to wind-dispersed seeds from native plants. Replanting of native vegetation, including trees and shrubs, can help ensure a more stable forest community for interior dwelling birds and other wildlife. For mature or second growth forests, ecologically sound and responsible management in conjunction with a professional forester is also key for the long-term health of this HUC-12. Practices such as selective thinning can help reduce competition for light and nutrients and enhance growth rates of remaining trees as well as improve diversity. Other practices may include controlling undesirable woody plants and invasive species and reforesting areas to create or expand woodlands. Poor harvest techniques can degrade forest land and contribute to soil erosion and stream impairments. Overtapping of maples, related to increased use of mechanical tappers and more elaborate tubing systems, is also a concern in this area. Overtapping can lead to decay and weakening of trees.

3.3.4 Goals and Objectives for Critical Area

The overall nonpoint source restoration goals of the NPS-IS plan is to improve IBI, MIwb, ICI, and QHEI scores so that partial or non-attainment status can achieve full attainment of the designated aquatic life use and that full attaining reaches may maintain their status. Bringing impaired sites into attainment and protecting attaining sites within these western tributaries is priority. Specific goals referencing assessment points are outlined here:

Goal 1: Protect Black Brook @ Fox Rd. by achieving an IBI score of 40 or higher.

ACHIEVED: Site currently has IBI of 40.

Goal 2: Protect Bridge Creek Dst. Ladue Reservoir @ Stafford Rd. by achieving an ICI score of 34 or higher (good).

ACHIEVED: Site currently has an ICI of Exceptional (≥46).

Objective 1: Protect, restore, or create wetland habitat.

- Protect, restore, or create 300 acres of wetland habitat within the critical area.
- Wetland setback adoption for Auburn, Hiram, and Troy Townships and implementation for Mantua Township.

Objective 2: Protect agricultural properties or timber harvest properties. This can include agricultural conservation easements, deed restrictions landowners voluntarily place on their priority to protect productive agricultural land, ground and surface waters, and wildlife habitat.

- Purchase (easement or fee acquisition) of 350 acres within the HUC-12.

Objective 3: Restore eroding or channelized streams.

- Restore 2,000 linear feet of eroding or channelized streams within the critical area using two-stage or natural channel design features and principles.

Objective 4: Implement forest stand improvement, wildlife habitat management, or ecological restoration (such as invasive species management and native plantings) on forested or former agricultural land.

- Work with interested landowners to develop management plans and implement improvements on 200 acres of land.

Chapter 4: Projects and Implementation Strategy

4.1 Projects and Implementation Strategy Overview Table

Table 3: Critical Area Overview Table: Black Brook HUC-12 (04110002 01 05)

Applicable Critical Area	**Goal**	**Objective**	**Project #**	**Project Title** *(EPA Criteria g)*	**Lead Organization** *(criteria d)*	**Time Frame** *(EPA Criteria f)*	**Estimated Cost** *(EPA Criteria d)*	**Potential/Actual Funding Source** *(EPA Criteria d)*
Urban Sediment and Nutrient Reduction Strategies								
Altered Stream and Habitat Restoration Strategies								
1	1-2	1	1	Black Brook Hardwood Forest Restoration	Akron	Mid term	TBD	USFS GLRI
1	1-2	1	2	Black Brook Corridor Native Plant Restoration	Akron	Mid term	TBD	GLRI
Agricultural Nonpoint Source Reduction Strategies								
2	1-2	1-4	3	Nutrient & Sediment Reduction in Agricultural lands	Chagrin River Watershed Partners	Mid term	$100,000	CRP, WRP, CREP, EQIP, RCPP, MRBI program funds
High Quality Waters Protection Strategies								
Other NPS Causes and Associated Sources of Impairment								

4.2 Project Sheets for LaDue Reservoir-Bridge Creek HUC-12

Project sheets will be added at a later date after additional planning and project development with stakeholders. This includes efforts by Black Brook Conservancy District and Mantua Township with assistance from CRWP to secure funding from FEMA to complete a flood study in this subwatershed to identify cost-effective project alternatives.

Works Cited

AkronOhio.gov. The Upper Cuyahoga River Watershed. https://www.akronohio.gov/cms/Water/Watershed_Cuyahoga/index.html. Accessed 10-16-2019. Copyright 2016.

Audubon.org. Important Bird Areas – Upper Cuyahoga. https://www.audubon.org/important-bird-areas/cuyahoga-river-upper. Accessed 10-16-2019. Copyright 2013.

Environmental Design Group. June 2013. Drinking Water Protection Plan for the Upper Cuyahoga River Watershed.

Fennessy, M. S., J. J. Mack, E. Deimeke, M. T. Sullivan, J. Bishop, M. Cohen, M. Micacchion and M. Knapp. 2007. Assessment of wetlands in the Cuyahoga River watershed of northeast Ohio. Ohio EPA Technical Report WET/2007-4. Ohio Environmental Protection Agency, Division of Surface Water, Wetland Ecology Group, Columbus, Ohio.

Ohio Environmental Protection Agency. 1999. Biological and Water Quality Study of the Cuyahoga River and Selected Tributaries. Geauga, Portage, Summit and Cuyahoga Counties, Ohio. Ohio Technical Report MAS/1997-12-4. Volume 1.

Ohio Environmental Protection Agency. Drinking water Source Assessment for the City of Akron. 2003. Protecting Ohio's Drinking Water Sources. Available online at http://wwwapp.epa.ohio.gov/gis/swpa/OH7700011.pdf. Accessed 12/7/2019.

Ohio Environmental Protection Agency. 2004. Total Maximum Daily Loads for the Upper Cuyahoga River. Final Report. Ohio Environmental Protection Agency, Division of Surface Water. 2019. Upper Cuyahoga monitoring data provided per request by CRWP.

Ohiodnr.gov. Cuyahoga River. http://coastal.ohiodnr.gov/cuyahogariver. Accessed 11-5-2019. Copyright 2019.

Portage County. 2015. Multi-Jurisdictional Hazard Mitigation Plan. Available online at https://www.co.portage.oh.us/sites/portagecountyoh/files/uploads/multi-jurisdictional_hazard_mitigation_plan.pdf. Accessed 12/7/2019.

Portage Soil and Water Conservation District (Ohio), U.S. Department of Agriculture, Soil Conservation Service., & U.S. Department of Agriculture. Forest Service. (1963). *Watershed work plan: Black Brook Watershed Portage County, Ohio*.

Appendix: Acronyms and Abbreviations

The acronyms and abbreviations below are commonly used by organizations working to restore Ohio's watersheds; many of which are included in this NPS-IS plan.

AOC	Area of Concern
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CSO	Combined Sewer Overflow
DELT	Deformities Eroded Fins, Lesions, and Tumors
EOLP	Erie-Ontario Lake Plain Ecoregion
EWH	Exceptional Warmwater Habitat

GIS Geographical Information System

Hg Mercury

HUC Hydrologic Unit Code

IBI Index of Biotic Integrity

ICI Invertebrate Community Index

LRW Limited Resource Water Mg/l Milligrams per Liter

MGD Million Gallons per Day

MIwb Modified Index of Well Being

MWH Modified Warmwater Habitat

NPDES National Pollutant Discharge Elimination System

ODA Ohio Department of Agriculture

ODNR Ohio Department of Natural Resources

ODH Ohio Department of Health

OEPA Ohio Environmental Protection Agency

PAH Polycyclic Aromatic Hydrocarbons

PCB Polychlorinated Biphenyls

QHEI Qualitative Habitat Evaluation Index

RAP Remedial Action Plan

SSO Sanitary Sewer Overflow

SWCD Soil and Water Conservation District

TMDL Total Maximum Daily Load Limits

TSD Technical Support Document µg/kg Micrograms per Kilogram

USACE United States Army Corps of Engineers

USDA United States Department of Agriculture

USEPA United States Environmental Protection Agency

USFWS United States Fish and Wildlife Service

USGS United States Geological Survey

USPC United States Policy Committee

VAP Voluntary Action Program

WAP Watershed Action Plan

WBP Watershed Based Plan WQS Water Quality Standards (Ohio Administrative Code 3745-1)

WRAS Watershed Restoration Action Strategy

WWH Warmwater Habitat

WWTP Wastewater Treatment Plant